Apple pollination: how honey bees find apple flowers

Apfelbestäubung: wie Honigbienen Apfelblüten finden

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Honey bees are important pollinators of apple (*Malus domestica*) flowers, yet little is known about how the bees find these flowers. As visual and olfactory floral cues are generally regarded as being most important for communication between flowering plants and their pollinators, we investigated visual (color) and olfactory cues of *M. domestica*, and determined their relative importance in attracting apple flower-inexperienced honey bees. Colour analysis using spectrophotometric techniques showed that pinkish-white petals of apple flowers appear UV-blue to bees. Scent analysis by dynamic headspace and gas chromatography / mass spectrometry revealed nearly 20 different compounds, most of them aromatics. Behavioural experiments performed in a flight cage showed that honey bees use both visual and olfactory cues to find apple flowers and that both cues are similarly attractive to the bees. The single scent components responsible for positive responses of honey bees towards olfactory cues need to be identified in a next step. Such components may then be used to manipulate behaviour of bees in order to optimize pollination success and fruit set of apple trees.

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I am a "flower": do blister beetle larvae of *Meloe* attract bee hosts by mimicking floral volatiles?

Ich bin eine „Blüte": locken Larven von *Meloe*-Ölkäfern Wirtsbienen durch Mimikry von Blütendüften an?

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Blister beetles (Meloidae) are enigmatic insects and well known for their toxicity due to cantharidin. The adults are herbivorous/florivorous and the larvae typically parasitize on insects, often on solitary bee larvae as well as their food provision. One of these beetles, *Meloe proscarabaeus* Linnaeus, 1758, occurs in high densities in the city centre of Salzburg at the bank slope of the Salzach river, where it parasitizes *Andrena vaga* Panzer, 1799 bees. This bee species is specialized on willows (*Salix* spp.) as it collects pollen for its larvae only from plants of this genus. Adult female beetles lay their eggs in the soil and the phoretic first larval instars (triungulins) attach to their bee hosts, which transport the larvae into their nest. A picture of Heiko Bellmann shows a female *Andrena* bee with a high pollen

load and many triungulins on its body. This finding suggests that larvae attached to the bee while she was foraging for pollen (and nectar) on willows. As willows are not available at the area where *M. proscarabaeus* breeds in Salzburg, we hypothesized that the triungulins produce olfactory cues known from willow flowers to attract their bee host. To test this hypothesis, volatiles released by different developmental stages of *M. proscarabaeus* were collected by dynamic headspace, analysed by gas chromatography and mass spectrometry, and compared with scents known from willows. We also tested scent samples collected from triungulins on antennae of *A. vaga* bees in order to test if volatiles released by the larvae can be sensed by the bees. The attractiveness of these scents to bees was tested in behavioural field assays. Data showed that egg and larval stages release large amounts of volatiles, several components thereof well known as floral scents of willows. Many thereof elicited antennal responses in *A. vaga* bees. Behavioural assays did not attract bee hosts. Overall, several data support the assumption that triungulins produce scents described from willows, but more behavioural assays are necessary to finally prove that these compounds are responsible for attracting *A. vaga* host bees.

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Akute Vergiftung der Hummel *Bombus terrestris* (Linnaeus, 1758) durch drei Pestizide und deren Kombination (Poster)

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Bestäuberinsekten wie Hummeln sind in der Natur einer gleichzeitigen Belastung durch unterschiedliche Pestizide ausgesetzt. In dieser Arbeit wurde die Wirkung von drei Insektiziden (Imidacloprid, Cypermethrin, Dimethoat) auf die Mortalität von Arbeiterinnen der Art *Bombus terrestris* untersucht.

Dazu wurde die akute LD50 nach 24 Stunden von jedem der drei Pestizide bestimmt (zwei bis fünf Durchgänge pro Pestizid). Anschließend wurden die Pestizide miteinander kombiniert verfüttert. Eine Menge von 20µl der Pestizidlösungen (Pestizid in 50%iger Saccharoselösung) wurde innerhalb von zwei Stunden angeboten und von den Tieren akut aufgenommen. Die Mortalität wurde nach 24 und 48 Stunden kontrolliert.

Erste Ergebnisse zeigen, dass die gemessenen LD50-Werte für alle drei Pestizide deutlich über den Literaturwerten liegen. Bei Aufnahme einer Kombination der LD50-Werte der drei chemischen Substanzen konnte eine erhöhte Mortalität beobachtet werden (zwei Durchgänge). Auch bei Reduktion der kumulativ applizierten Pestizide auf ein Zehntel der LD50 jedes Stoffes konnten noch geringe Effekte beobachtet werden (zwei Durchgänge).